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ABSTRACT

Since general principles of first language acquisition and environmental input have been clarified by research of the last decade, more differentiated questions are explored in the present study. The main goal is the investigation of similarities and differences in the language teaching and learning processes involved in the verbal interactions between mothers and children. A concomitant focus lies upon the differential description of the sequential relationships between maternal input types and filial acquisition strategies. Two mother-child dyads were studied wherein the children were approximately matched in mean length of utterances which ranged between 1,5 and 4,0 morphemes. The ages of the children ranged between 18 and 35 months. Thirty-nine maternal teaching techniques and 37 filial learning strategies were differentiated and their sequential dependencies were studied. The structure of the interactions was described quantitatively by means of transitional probabilities and by contrasting the observed frequencies with expected ones. The import of the interactions was also tentatively interpreted on the basis of linguistic, instructional, and psychological principles. Although wide quantitative differences between the two dyads were found, it appeared that the two middle class mothers had adopted qualitatively similar strategies. The two children, however, seemed to follow qualitatively divergent approaches in their strategies of language acquisition. (Author)

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Differential Analysis of Language Teaching

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Running head: Differential analysis

Abstract

Since general principles of first language acquisition and environmental input have been clarified by research of the last decade, more differentiated questions are explored in the present study. The main goal is the investigation of similarities and differences in the language teaching and learning processes involved in the verbal interactions between mothers and children. A concomitant focus lies upon the differential description of the sequential relationships between maternal input types and filial acquisition strategies. Two mother-child dyads were studied wherein the children were approximately matched in mean length of utterances which ranged between 1,5 and 4,0 morphemes. The ages of the children ranged between 18 and 35 months. Thirty-nine maternal teaching techniques and 37 filial learning strategies were differentiated and their sequential dependencies were studied. The structure of the interactions was described quantitatively by means of transitional probabilities and by contrasting the observed frequencies with expected ones. The import of the interactions was also tentatively interpreted on the basis of linguistic, instructional, and psychological principles. Although wide quantitative differences between the two dyads were found, it appeared that the two middle class mothers had adopted qualitatively similar strategies. The two children, however, seemed to follow ~~also~~ qualitatively divergent approaches in their strategies of language acquisition.

Differential Analysis of Language Teaching

Two decades of research in developmental psycholinguistics have resulted in the generally accepted knowledge that children learn their first language in a slow and gradually groping way. After around one decade of research into the causes of this development, it is now also widely agreed upon that maternal speech input is specifically suited to facilitate the children's language acquisition, (e.g., Furrow, Nelson & Benedict, 1979) although a few sceptical voices are still encountered as to whether maternal input is specifically tailored to the children's learning needs (Newport, Gleitman & Gleitman, 1977). Presuming the fact of gradual learning and the importance of maternal input as established, the present paper is aimed towards more differentiated questions. Most previous studies either employed single case studies which do not permit comparisons across subjects or they centered upon larger numbers of children, and reported average results. Yet for both children (Nelson, 1973) and mothers (Moerk, 1974) convincing evidence of individual and dyadic differences has been encountered. The present study is, therefore, exclusively focused upon comparisons between dyads. Additionally, most previous studies focused either upon the children's progress in language acquisition (e.g., the many publications of R. Brown and associates) or upon maternal input at one time with children's language level at a considerably delayed time (Brown, 1973; Nelson, 1973) without exploring the interactions between children and their mothers. What is needed to understand the processes of language transmission and language acquisition, however, is the exploration

of the relationships between maternal input and filial use of this input combined with those between filial production and maternal feedback. The available evidence on learning and memory suggests namely that the effects of input and feedback should be most noticeable in those utterances of the child that follow the maternal model after an only brief interval. The main focus of the present study is therefore directed towards a comparison of the immediately consecutive utterances of the mothers and children. These sequential relationships will be explored as they appear in each dyad.

At the present state of the research endeavor only descriptive approaches are factually justified. But since pure descriptions of interactive sequences could appear to be devoid of psychological/instructional meaning, suggestions as to linguistic learning and psychological processes will be made. These tentative hypotheses will always be carefully differentiated from the factual descriptions.

Method

The interactions analyzed are derived from the two dyads whose child partners have been made famous by Roger Brown under the names of Adam and Eve. For Eve, Brown's total range of interactions was used, spanning an age range from 18 to 27 months and an MLU range from around 1,5 to 4,0 morphemes per utterance. For Adam, an approximately matched sample was utilized, spanning an age range between 27 and 35 months and an MLU range between 2,0 and 2,5 morphemes. For both dyads the analysis began with the earliest transcripts collected. Of the 20 two-hour samples collected for Eve, every second one was used. The equivalent samples of Adam encompassed altogether 18 two-hour recordings of which every second sample was utilized, too, The

reasons for reanalyzing the transcripts collected by Brown were at least two-fold: First the amount and quality of information contained in them is great indeed. Furthermore, Brown and associates have presented many excellent analyses concerning the children's progress in their language skills. When the present investigations provide evidence concerning the process of teaching and learning involved in language transmission, these process aspects can then be matched with the product aspects contained in Brown's and others' studies.

The overall approach to the analysis, of which only selected features will be emphasized in the present report, involved a differentiation of multiple aspects of the interaction. Each utterance was categorized according to its content as referring to an either new, old, or partially new theme, or as a return to an old topic after an unrelated subtopic. Illocutionary force aspects were differentiated in order to specify the functional/pragmatic dimension of the interactions. Finally, the main topic of the present report, 39 categories for maternal teaching techniques and 37 categories for children's learning strategies were specified and computer-coded in their sequential arrangements. Since many utterances entailed more than one technique/strategy, multiple coding of up to three techniques/strategies per utterance was employed. The maternal teaching techniques are briefly described in Table 1. The filial learning strategies were defined in an identical manner with the exception of a few items which are specially remarked upon in Table 1.

Insert Table 1 about here

It would transcend the limits of this brief report to define all these categories in detail. Since the terms are quite well known from the literature on maternal input phenomena (especially Cross, 1974) and children's language exercises (especially Clark, 1972; Weir, 1962), they can be presumed as familiar. Detailed explanations of the differential coding criteria can be obtained from the author. Only a brief description of the major subsets will be provided.

The approximately 40 categories of teaching techniques/learning categories fall into several larger subsets as follows: Categories one to ten are forms of imitation. Those between 20 and 29 encompass various forms of self-repetition. The two items in the forties represent obvious corrections, although most maternal imitations can and often do entail corrections too. This applies almost systematically to the maternal category 2 "Expansions," at least in the case of the two young children studied here. When their mothers expand, they mostly improve the grammar of the child's utterance by adding morphemes. The categories in the 50-ies and category 71 refer to forms of initial modeling whereby the emphasis lies upon the word "initial." Much maternal modeling is namely also encountered in the various forms of imitation and even more importantly for instructional purposes in some forms of self-repetition. It will later be indicated how the mothers in systematic alterations and reformulations of their statements analyze syntactic and morphological structures for their children. Employing a presently favored concept, the difference between the forms of modeling could be described as "simple modeling" in the case of the fifties and 71 whereas self-repetitions and modeling of corrections in the form of imitations

demonstrate meta-aspects of the language code.

The two categories in the sixties involve specification and clarification of messages whereas codes 80 and 81 represent reinforcement aspects. Finally categories 99 and 00 were used as two separate "wastebasket" categories. Code 99 signifies that linguistic teaching techniques were observed--often in the form of phonetic/phonemic teaching--but that no category existed for this specific type. Code 00 was used for brief exclamations, greetings, and mostly for those instances where dashes in the transcripts indicated an utterance of one member of the dyad but where the transcribers could not understand the utterance on the tape. Complex problems were encountered in the struggle for acceptable reliabilities between the various coders and between repeated codings by the same coder. The fact that in spite of multiple coding only three codes could be used per utterance even if more categories of techniques/strategies were differentiated compounded the problems. The exact procedures employed have been separately summarized and can be obtained upon request. Counting only correct categorizations as criteria for interraterreliabilities, even if the different coders did not eliminate the same technique/strategy in Utterances entailing more than three codes, the reliabilities obtained ranged between 80 percent and total agreement. They were mostly in the middle nineties.

Results

First, very general quantitative measures shall be presented to suggest the overall style of the dyadic interactions. These data are briefly integrated in Table 1.

Insert Table 2 about here

Considering first the topmost four cells of Table 2, a profound difference in the dyads is immediately suggested. The numerical relationships between the maternal and filial utterances are almost exactly reversed in the two dyads. Whereas Adam produces around 50 percent more utterances than his mother, Eve's mother surpasses her child also by around 50 percent in utterance frequency. When the relationships between filial strategies and maternal techniques in the next four cells are considered, a similar contrast appears. Eve's mother surpasses her child by even more than 50 percent in the frequency of instructional techniques, whereas Adam surpasses his mother by around 25 percent. That the proportions in the overall number and in the number of strategies/techniques are not the same is due to the fact that strategies and techniques could be multiply coded as discussed in the method section. The relationships between Total N and strategies/techniques are the following for each of the dyads: Adam's dyad produced 12,360 utterances and 20,309 strategies/techniques whereas Eve's dyad produced 9,734 utterances and 16,559 strategies/techniques. These preliminary quantitative data indicate that Eve's mother did not only produce relatively more input for her child, but even more markedly, she provided more linguistic instruction.

The next section of Table 1, pertaining to Episode Structures is theoretically of great interest, since the introduction of new themes requires on the part of the decoder of a message much greater information processing involvement than if the speaker merely continues an old theme.

Macnamara (1972) has already suggested that the child might decipher the language code on the basis of the parallels between known content and unknown code. This hypothesis is strongly supported by the present data. All communication partners introduce new themes only rarely, and the two mothers do it to a negligible extent. They maintain the same theme between 13 and almost 30 times more often than they introduce new themes. And in both dyads the children introduce new themes around four times as frequently as their mothers. But even the children continue around five times more often with the same themes than they introduce new ones.

Besides these astonishing similarities in the proportions within the dyads, there exists also one clear difference: Eve's mother makes the communication process easier for her daughter by producing the most same-theme and the least new-theme utterances--which are, as the data in the first section of Table 1 have shown, linguistically more informative. Similar principles can be discerned in most of the following figures where they will be repeatedly remarked upon.

The following three figures with their sub-sets and therewith the main focus of the paper is centered upon maternal flexibility in instructional techniques. Each figure centers upon a different type of flexibility. Figure 1 upon versatility in feedback provision in response to one specific learning strategy of the child and Figure 2 upon the wide range of antecedents to which one specific type of feedback is applied by the mother. Whereas Figure 1 stresses substitution of feedback types and thereby highly discriminative responding by the mother, Figure 2 reflects more parsimonious approaches by the mother in that she employs standard techniques which

suffice as a response to a variety of filial learning strategies. Figure 3, finally, is seen as reflecting most intense teaching wherein two maternal techniques immediately follow each other giving the mother the chance to convey information in a more concentrated manner. Whereas the major points pertaining to each of the figures will be discussed, it can not be attempted to interpret every pattern reflected in these figures. Not only would the scope of a journal article not permit this, but it would be also redundant since it would represent only a repetition of the data presented in the pertinent figure.

The format for Figures 1 and 3 is the same and shall be described first. The patterns from the two dyads involving Adam and Eve are always juxtaposed for easier comparison. At the leftmost margin is a Roman lower case letter indicating the subset of the figure. Next follows the column representing the antecedents which are referred to by their code numbers. The category labels are found in Table 1. The next column contains the code numbers referring to the subsequent utterance in the interaction sequence. The following column with the heading F_o indicates the observed frequencies for each specific pattern. For example, the pattern in Figure 1 (a) Adam 29 - 29 was found 219 times. Since the total number of utterances were different for the two dyads, the next column expresses these frequencies as percentages, so that the two dyads can be compared also in regard to relative frequencies. Finally, the last column represents the frequencies expected if only chance cooccurrences of the strategies/techniques were encountered. Those expected frequencies were calculated in accordance with the following formula:

$$F_e = p_i \cdot p_j \cdot f_2$$

whereby p_i is the probability of the antecent code

p_j is the probability of the second code and

f_2 is the total number of dyads.

Further to the right the data for Eve and her mother follow the same arrangement.

In contrast to Figures 1 and 3, the sequence of the columns in Figure 2 is slightly different. But since all the headings are identical, Figure 2 can easily be interpreted on the basis of the just preceding explanations. Substantive interpretations will be provided after Figure 1 has been discussed.

Insert Figure 1 about here

Section (a) of Figure 1 deals with one of the most basic aspects of language development, that of vocabulary acquisition. Since code 29 is defined as Vocabulary Perseveration, the child's use of a specific vocabulary item as indicated in the leftmost column for both Adam and Eve is already a repetition. For both children, the most common maternal response is another vocabulary perseveration, code 29. As the comparison of F_o and F_e suggests, the 29 - 29 sequence is certainly a pattern that could not be attributed to simple chance cooccurrences of the two codes. The term "pattern" will be employed in the following sections as a brief label for those cooccurrences that are considerably more frequent than what would be expected by chance. It will be employed in contrast to the terms "cooccurrence" or "sequence"

which do not imply any systematic response tendency.

Maternal repetition is again encountered in both the patterns 29 - 2 and 29 - 1. But in these cases more than the vocabulary item is repeated. In contrast to these cases wherein the child's strategy elicits specific maternal responses, maternal syntactic exercises, codes 27 and 28, tend to be suppressed after the child's preceding vocabulary rehearsal in both dyads. Such a tendency to avoid concurrent rehearsals of different linguistic skills will be encountered often in the subsequent figures. It suggests that the two mothers might be well aware of the limited information processing capacities of their young children. Both mothers do not avoid repeating bound morphemes immediately after the child rehearsed a vocabulary item as seen in the 29 - 24 sequence, although no strong tendency to do this can be discerned.

Besides such considerable similarities between both dyads, clear differences stand out too. The most obvious one is the much wider range of maternal patterns in Eve's case. To make the range of patterns comparable, the lower cut-off point for both dyads is the same in each subset and it lies generally at the .06 or .07 percentage level. Impressive is also the frequent provision by Eve's mother of positive reinforcement, code 80, after Eve's vocabulary rehearsal and its comparative absence in Adam's case. That this is a systematic response of Eve's mother can be recognized through a comparison of F_o and F_e for the pattern 29 - 80. Similar patterns, although much less frequent ones, appear in connection with correction and negative reinforcement, patterns 29 - 40 and 29 - 81 in Eve's dyad. These patterns are also absent in Adam's dyad. In addition to avoiding code 27,

Frame Variation, Eve's mother avoids also code 25, Replacement of major constituents, another syntactic exercise.

In summary, repetition is the major technique both mothers employ after the child's vocabulary rehearsal. Bound morpheme perseveration is not avoided but not strongly emphasized, and syntactic exercise are generally suppressed when the child focuses upon vocabulary skills.

Subset (b) of Figure 1 with code 24, the child's Bound Morpheme Perseveration, as antecedent represents one of the extremely rare instances wherein Adam's mother produces more patterns and produces these patterns more frequently than Eve's. This reflects the fact that in the dyad with Adam bound morphemes were more strongly emphasized. The overall principles are again the same as in subset (a). Repetitions of the children's morpheme by the mothers are elicited, codes 1, 2, 24, and several more complex syntactic techniques, codes 25 and 27, are suppressed. That Eve's mother is more prone to provide positive reinforcement, code 80, is again seen together with another systematic difference, which will be encountered repeatedly: this is the tendency of Eve's mother to use more generally code 29, vocabulary perseveration, in various response patterns. The actual transcripts suggest that vocabulary perseveration is somewhat easier for the child and might therefore be used as a "filler" in the course of the interactions. This impression needs, however, still systematic substantiation.

Subset (c) of Figure 1, introduced by the child's mapping of environmental configurations, code 51, indicates a high degree of qualitative similarity of the dyads although it is obvious that Eve's mother responds with many more and more frequent patterns. Equally clear is the emphasis

of Eve's mother upon positive reinforcement and its absence in the dyad with Adam. The potential instructional value of the interactions might be exemplified by means of a few patterns: If the child maps environmental configurations, code 51, upon a linguistic structure, the two mothers are highly prone to add minor morphemes, codes 2 and 24, or to imitate the children's utterance exactly, code 1, accepting thereby their attempted mapping. The same acceptance is shown in the repetition of the mapping, pattern 51 - 51, although minor improvements may be added in this case too.

In subset (d), differences between the two dyads predominate. Adam's mother does not produce any strongly patterned response to Adam's Imitation with Reduction, code 2. In contrast, Eve's mother systematically rewards imitation, code 80, adds expansions, code 2, or imitates the child while repeating herself, code 9. All of these maternal responses appear to have clear instructional value after filial reduced imitations. Similarly, the pattern 2 - 23 appears instructionally meaningful: Eve has shown in her reduced imitation that she has grasped the mother's main message structure. Her mother feels therefore free to "build-up" her message by adding major elements. One similarity between both dyads lies in the fact that both mothers tend to refrain from rehearsing bound morphemes, code 24, after the children have just shown that they couldn't process the minor morphemes. The contrasting tendency in the case of Eve's mother regarding the codes 2 and 24 has, however, to be explored qualitatively. A final contrast between the two dyads lies in the fact that code 25, Replacement Sequences, is preferred by Adam's mother but tends to be avoided by Eve's mother after filial reduced imitation.

Finally, subset (e) of Figure 1 wherein the sequences are introduced by Replacements of Major Constituents in self-repetition sequences by the child, reflects important syntactic exercises. These are the well known substitution drills which have been employed generally in second language training. Their patterned appearance in first language learning/training might therefore be of special interest. With the exception of the positive reinforcement which is provided only for Eve, the patterns in both dyads are similar enough to be discussed together. Most frequent for both children are minor morpheme additions by the mother, codes 2 and 24, although the sequences 25 - 24 is not very much above chance in either of the children. Exact imitation, code 1, is also a clearly established response pattern in both dyads, together with the quite rare Substituting Imitation, code 4, and the Chaining together of utterance parts of the child and the mother, code 7. Contrasting correction, code 40, appears as a clear pattern in Eve's dyad; and in both dyads code 0, Uncodable, on the mother's side follow's the child's code 25 exceptionally often. The meaning of this last pattern still has to be explored in qualitative investigations.

As the physical arrangement of the columns in Figure 2 already indicates, the goal of this figure is the opposite of Figure 1. Figure 2 is intended to indicate more clearly the importance of each of a few response types of the mother. If the observed frequencies are added up and divided by 20 and 18 for Eve and Adam, respectively, a preliminary impression of the importance of each response type in the maternal feedback repertoire can be gained. To gain a more complete impression the pertinent data from Figure 3 have to be added. The specific patterns in Figure 2 indicate which

filial learning strategies elicit each specific maternal response.

Insert Figure 2 about here

Subset (a) of Figure 2 presents a most impressive contrast between the dyads. Conditioned reward is basically not provided by Adam's mother, but it is employed very commonly by Eve's mother, amounting to almost 30 instances per hour. The question as to what Eve's mother rewards can be answered quite precisely: most often vocabulary learning, codes 29 and 50; also simple syntactic productions, codes 51 and 2; less frequently but also systematically syntactic analyses, codes 25, 22, 27, 23; and partly also bound morpheme perseveration, code 24. In brief, Eve's mother rewards her daughter's attempts to master everyone of the major aspects of language skills that were included in the study.

Subset (b) of Figure 2 centers upon maternal expansion, the principle described so clearly by Brown in his early studies. It might be worth specifying again that expansions entail mostly a correction of the child's preceding utterance even if the corrective force of the feedback is not emphasized by the mother. Keeping in mind this consideration and the theoretical controversy as to the absence or presence of linguistic corrections, the overall frequency data might be of interest. In Adam's dyad the sum of the F_o approaches 870 suggesting an average of around 50 instances of expanding corrections per hour. In Eve's dyad the total is only slightly above 600 which suggests an average of around 30. It is admitted that these averages and totals give an exaggerated impression of the frequencies due to the fact that multiple coding of strategies was used

so that one utterance of the child that was expanded could have been coded three times as to strategies and the resulting patterns could appear three times in the subset. Since instances of triple coding for the child were relatively infrequent, only minor reductions of the above frequencies have to be considered. This still leaves frequencies that can not easily be discounted.

When considering the specific patterns in subset (b), their instructional meaningfulness is very plausible. They pertain with few exceptions to simple-syntax learning strategies of the child: codes 2, 21, 22, 23, 25, and 51, i.e., the children struggle with a syntactic form by repeating themselves or imitating their mothers and the latter are prone to squeeze in minor morpheme teaching in the form of expansions. Since it is known from Brown's (1973) analyses of the same two children and from many other studies that children of this age range do not yet master most of the minor morphemes and omit them mostly, this expanding maternal feedback does not only provide missing elements in the children's sentences but it provides it also at an instructionally optimal instant, that is, at the time when the children have already processed all the major semantic and linguistic elements of the utterance and can therefore apply their entire information processing capacity to the additional elements provided by the mother. Triple sequences will be described in a future publication to indicate the effectiveness of this intervention. It might be worthwhile to ponder the fact that in none of all these sequences maternal expansion is suppressed by an antecedent of the child. Whether these mothers really do not consider expansions instructionally counterindicated after any of these antecedents or whether the discrepancy between the child's product and their own linguistic

rules is cognitively so commanding as to systematically induce the correction cannot yet be decided.

Subset (c), exact or reduced imitation by the mother represents once again one of the rare instances where the dyad with Adam surpasses Eve and her mother both in number of patterns and in their frequencies. With only one exception, code 24, the most frequent patterns in Adam's dyad reflect also more complex linguistic productions of Adam's as compared to Eve's: code 50 is spontaneous vocabulary production as compared to mere vocabulary perseveration, code 29, in the first place in Eve's dyad; codes 22, 25, and 23 represent syntactic analyses, i.e., almost metalinguistic activity on Adam's side, whereas Eve's code 51, refers to simple mapping and the patterns with 25 and 22 are much less frequent. Adam seems therefore to produce more complex constructions, which since they are more complex and probably also more complete--though the latter has to be rechecked in the texts--can be imitated by the mother in identical form. This subset reinforces, therefore, the impression that Adam struggles much more self-sufficiently in his task of language acquisition.

Subset (d), Frame Variation, on the mother's side represents a rather complex category as the definition in Table 1 indicates. Extensive familiarity with the transcripts suggest that the two mothers employed this category predominantly in two contexts. One is that of quite direct syntax teaching by demonstrating how various forms of optional transformations can be employed with minimal or no change in the meaning of the utterance. The second use could be described as repair sequence since Frame Variations proceeded often from the more complex to the syntactically simpler and more

familiar form. For example, the sentence "That's a barking dog" might be reformulated as "This dog is barking" if the child responded with confusion to the first utterance. Subset (d) exhibits patterns fitting both functions. Most frequent and above chance cooccurrences is the repair function, pattern 0 - 27, in both dyads. Pattern 60 - 27 in Eve's dyad represents probably a repair sequence too. Syntactic exercises are suggested by the filial antecedents of 2, 20, 22, 23, and 25. Since almost all of the cooccurrences are less frequent than expected by chance, an active inhibitory influence of filial syntactic strategies upon the maternal use of Frame Variation is suggested for the present dyads. This phenomenon suggests that the mothers wanted to avoid too high demands on the information processing capacities of these two quite young children. Since Frame Variation is a complex category, finer coding differentiations will, however, be necessary before confident conclusions are justified.

The last subset of Figure 2, set (e), pertains to maternal optional transformations which were most commonly realized as alternations between affirmations and questions. Negative transformations were, however, common too. The three elicitation patterns in Adam's dyad, 0 - 28, 28 - 28, and 7 - 28, suggest again repair sequences. It will have to be explored in a subsequent study whether maternal 28 in these patterns entails mostly the illocutionary force code employed for the clarifying query. The suppressing effect of the two filial codes 29 and 50 upon maternal 28 indicates again that Adam's mother might avoid additional transformational tasks when Adam concentrates upon vocabulary learning. Most other cooccurrences would be expected by chance.

In Eve's dyad, the three outstanding patterns, 25 - 28, 28 - 28, and 61 - 28 together with qualitative information from the transcripts suggest again repair sequences. This is most persuasive in the case of 61 - 28, i.e., item specification on the child's side. 28 - 28 patterns suggest question-answer sequences, and constituent replacement, code 25, is a strategy commonly encountered in the simplification of messages when, e.g., pronouns are replaced by proper names. But in contrast to Adam's mother, Eve's mother avoids the pattern 0 - 28. Since the transcripts show that Eve, the considerably younger child, was often not able to answer more difficult maternal questions, the reason for this avoidance appears plausible though it cannot yet be proved. Most of the other cooccurrences could also be due merely to chance.

It can be preliminarily concluded from the data presented in Figure 2 that both mothers have established patterns either of responding with a specific category or of avoiding it after specific antecedents in the children's speech. Instructionally meaningful communalities could be indicated which were, however, interspersed with idiosyncratic response tendencies. Although the latter appeared interactionally meaningful from close knowledge of the language performance of the children, these interpretations are post-hoc and not yet supported by demonstrated facts. They can, therefore, be only considered as tentative hypotheses.

Figure 3 and its subsets are most interesting considering the goals of the present study. They reflect situations during which the two mothers engaged most intensively in teaching techniques by employing at least two of them in immediate succession. Differential engagement of the two mothers

in the teaching process might, therefore, be most obviously visible in these instances. This is exactly what is found in all the subsets of Figure 3. In none of them does Adam's mother engage in more teaching patterns or does she produce them more frequently than Eve's mother. In many of the subsets the difference between the two mothers is even quite large. The subsets will be surveyed only briefly since many patterns have been discussed in connection with preceding figures.

Insert Figure 3 about here

For all the subsets of Figure 3 it might be worth noting that the two mothers engage almost exclusively in self-repetitions, the codes in the 20-ies. This phenomenon is not necessarily an artifact of the analytical format. Mothers could easily retain the conversational lead while switching to completely new topics and new utterance types. Self-repetitions, however, can be expected to make the information processing tasks much easier for the children.

Subset (a) of Figure 3, dealing with Vocabulary Perseveration, code 29, as introductory item exhibits both qualitative similarity and large quantitative differences between the two mothers. The differences in the number of patterns and in their frequencies are obvious. The relatively frequent positive reinforcement that Eve's mother dispenses represents another already familiar difference from Adam's mother. The similarities lie in the close congruence of the most frequent patterns: Both mothers suppress Bound Morpheme Perseveration, code 24, after they have introduced vocabulary exercises and they do not stress syntactic exercises. Eve's mother seems

to avoid also semantic overload, as suggested by the suppression of the pattern 29 - 51 that appears less frequent than expected by chance. She certainly avoids irrelevance in the second utterance of her sequence, codes 0 and 99.

Even in the case of subset (b), with patterns that begin with code 24, Morpheme Perseveration, which has been more emphasized by Adam's dyad (cf. Figures 1 & 2), Eve's mother excels in the number of patterns even if not clearly in the frequencies of the more common cooccurrences. The emphasis upon repetitiveness and syntactic techniques in the second item of the patterns is evident. But many of these cooccurrences barely exceed chance frequencies. Similarly as in subset (a) where the antecedent code 29 acted as suppressor for the code 24 in the second position, so in subset (b) the antecedent code 24 acts as suppressor for the subsequent code 29; that is, mothers avoid combining Morpheme Perseveration and Vocabulary Perseveration in close succession. That the children's information processing restrictions may be the cause can only be hypothesized on the basis of the presented data. Triple sequences and longer chains will have to be analyzed to explore how children react in those instances when mothers convey information in a very concentrated manner. That such an interpretation might be premature is suggested by the cooccurrences in which the second items are a 25, 27, or 29. Though some of these cooccurrences barely exceed chance frequencies, they certainly indicate that the mothers did <u>not</u> refrain from providing syntactic information after they had emphasized bound morphemes. Interesting as potential support for the overall interpretation of the data as maternal teaching is the fact that, most clearly in subset (b)

but also in many of the other subsets of Figure 3, code 0, Uncodable is suppressed in second position. This seems to suggest that mothers, once engaged in teaching, are not prone to waste one of their utterances through lack of clarity or irrelevance to the task in question.

Subset (c) shows first that Adam's mother does not include the relative simple Mapping of environmental givens, code 51, in her intensive teaching episodes. Eve's mother does it quite frequently and combines it predominantly with simple syntactic teaching techniques, codes 27 and 51. Techniques entailing a shift in linguistic categories, codes 24, 28, and 29 follow less frequently than expected by chance. That Eve might have problems in mastering maternal mapping is suggested by the pattern 51 - 23 wherein a break-down follows the mapping. The pattern 51 - 27 could suggest the same phenomenon.

Subset (d) is impressive by the qualitative similarity of the results in both dyads and by their psychological plausibility--at least for the writer. The introductory item, code 2, Expansion by the mother, has a corrective function and is linguistically highly informative since the child had just omitted obligatory sentence constituents and the mother provides them as feedback. Since the children did omit these constituents, it can confidently be concluded that they still had processing difficulties in their regard and that the corrective maternal input will require a considerable amount of their information processing capacity in order to be handled fruitfully. Sensitive mothers should, therefore, employ techniques in the second step of their intervention that offer little additional information. This seems to be generally the case. Both mothers suppress techniques 24 and 29, Morpheme

Perseveration and Vocabulary Perseveration, i.e., techniques that would introduce new linguistic information. Category 27, Frame Variation, is elicited in both dyads and Eve's mother adds Reward, code 80, and Replacement sequences, code 25 which can have simplifying functions. Most of the other categories appear only at chance level after code 2. Considering the first three patterns of Eve's mother, plausible teaching sequences can be observed. After the mother adds minor morphemes, code 2, to the child's utterance, she clarifies the syntactic structure of the sentence, codes 25 and 27, or she softens the blow of the corrective force of code 2 by providing conditioned reinforcement.

Subset (e), Replacement sequences of major constituents, is the well-known substitution drill of the second language teacher. Similarly as in the case of subset (c), with code 51 as antecedent, Adam's mother employs sequences beginning with this code much less frequently than Eve's mother. Only the pattern 25 - 27, i.e., double syntactic analyses, is well established. In contrast, Eve's mother employs pertinent patterns very frequently and in a linguistically well-planned manner. One replacement is followed either by another one, code 25, by an optional transformation, code 28, by a breakdown sequence, code 23, or by a build-up sequence, code 22, all entailing further metalinguistic analyses. The pattern 25 - 26 combines clarification of major constituents with those of elements of the constituents. Patterns 25 - 24 and 25 - 29 are generally suppressed or at least very infrequent in Adam's case, indicating again that shifts in the category of learning contents are avoided. Eve's mother suppresses again irrelevant sequences, i.e., 25 - 0, and also semantic shifts, i.e., 25 - 51.

Concerning subset (f), beginning with code 27, Frame Variation, the description could be repeated almost verbatim. 27 - 24 and 27 - 29 are suppressed and purely syntactic exercises, 27 - 27, 27 - 28, 27 - 25 generally surpass chance expectations. Eve's mother avoids the pattern 27 - 51, i.e., a semantic shift after a syntactic variation. New semantic content, i.e., Mapping, might overtax her child. Irrelevance, i.e., 27 - 0, is avoided again.

Finally, subset (g) beginning with code 28, Optional Transformations, presents again a repetition of the already familiar. Same-type linguistic exercises are more frequent than expected by chance in second place, codes 28, 25, 26, 27, and probably also code 23. Other-type linguistic input is less frequent in second place than expected, code 24 for Adam and code 29 for Eve. Code 24 in Eve's case represents, however, a borderline but unpredicted exception. Eve's mother provides these patterns approximately twice as often as Adam's mother per hour, a quantitative difference that was encountered quite commonly.

Most of the subsets of Figure 3 suggest that in spite of considerable differences in the amount of structured input provided, both mothers follow qualitatively similar patterns which match common-sense instructional principles and seem to correspond with known capacities for information processing of young children.

Discussion

It may be highly unusual and potentially disastrous for the chance of getting this paper published to begin the discussion with an admission of puzzlement and a request for advice. But there is one set of theoretically

important questions that remains unanswered for the writer even after months of thought. These are the questions as to the probable or logical relationships between degree of patterning of the input and the interactions and their teaching/learning potential. It was generally assumed that cooccurrence patterns whose frequency clearly surpasses chance cooccurrences and which appear instructionally meaningful contribute to teaching/learning. More complex is the problem in those relationships which have been labelled suppressant in the paper, that is, where the cooccurrences appear less frequently than expected by chance but still with a frequency large enough to rank high in the order of sequences. These cannot be outrightly disregarded as irrelevant to teaching and learning, considering the findings in studies on one-trial learning and hypothesis testing. If $P_{j/i}$, the transitional probability, is smaller than p_j, the unconditional probability, it could be that j is highly effective just because it follows i in relatively rare instances. But theoretically most challenging seems to be the question whether random cooccurrences, when $P_{j/i}$ matches approximately p_j can be effective as teaching/learning occasions. Since the provision of the feedback follows randomly after certain antecedents, it could easily be concluded that it cannot have any systematic effect. But on the one hand, even rather random provision of praise could affect the interactional "climate" and might be interpreted by children as a validation of their preceding utterance. On the other hand, if corrections would be supplied by a mother at fixed time intervals, which would probably result in apparently random cooccurrences, it does not seem self-evident that the corrections would have to be ineffective.

Since the present report was mainly descriptive, centering upon the interactions found, the questions as to instructional effectiveness were not yet central. But since the long-term goal is to study the results of these instructional interactions as apparent in the speed and degree of language development, and since pertinent suggestions were made in this paper, this problem is certainly of great interest.

This secondary approach of the present paper, i.e., the attempt to linguistically/instructionally interpret some of the encountered patterns will certainly draw the criticism that it represents too speculative an approach. In an epistemological perspective, the level of description has not always been fully separated from the level of explanation. It shall, therefore, be reaffirmed that the data are seen as purely descriptive. The interpretative comments are always proferred and mostly specified as tentative hypotheses. The reason for providing them was to enrich the descriptive approach with knowledge derived from developmental psychology, e.g., pertaining to the information processing capacities of children, from linguistics, e.g., the differentiation of categories of instructional content, and from the qualitative data in the transcripts, i.e., how the children handled the input and feedback. In this manner the results become potentially more meaningful as to their instructional implications. It is, of course, presumed that the proposed hypotheses will be tested and possibly be refuted.

Since it is often easier to learn from imperfections, one quite obvious imperfection and one quite probable one in the category delimitations shall be specified: Category 27, Frame Variation, is not only syntactically too

broad but it subsumes also two instructionally quite contrasting principles. In some cases, code 27 represents a simplification and contributes to a repair sequence. In many other cases it appears to represent a complex modeling of the function of diverse constituents in changing sentence frames and it appears to be a highly demanding technique as employed by the mother. Similarly, category 25, Replacement Sequence, appears often as a simplification when more difficult items are replaced by simpler ones, such as the pronoun by a proper name. In these instances, the semantic content remains the same. In other instances, however, the semantic content changes and only the sentence frame and the constituent category, e.g., a prepositional phrase, remain the same. In the latter case even the surface form of the constituent category can change drastically, such as when in the box is replaced by under it in the explanation: It's not in the box; it's under it. Interactional evidence suggests that these latter instances are almost the opposite of simplifications since they require both complex syntactic and semantic analyses. Further refinements of the category system will certainly be attained with prolonged experience in instructional analyses.

Having broached these methodological and theoretical questions, some suggestions concerning the overall meaning of the results shall be briefly raised. It appears generally that Eve's mother contributes more in the interactions and that her contributions are better patterned. Her input also seems to be easier for the child to process and more rewarding, whereas Adam is confronted with more difficult tasks and has to rely more on his own devices. At first glance, this seems to be only fitting since Adam is older than Eve. But the children's samples were approximately matched on

the basis of mean length of utterance in morphemes which suggests that the children should be linguistically at the same level. With Eve obtaining the better input and apparently progressing faster, it is tempting to conclude that a cause-effect relationship exists between input form as described and Eve's progress. But a qualitative study of the transcripts suggests that Eve's performance often lies below Adam's. In addition, the analysis of the type of illocutionary force categories encountered in the interactions suggests that the matching in MLU might be misleading. In contrast to Eve, Adam engages namely much in monologues. As Clark (1974) has shown and as clearly indicated in the present transcripts, monologuegic utterances of children are shorter than dialogue utterances, since children often incorporate into their dialogue utterance elements from the preceding more complex adult utterance. This is less readily possible in the course of a prolonged monologue of the child when the adult utterances are temporally remote. Since Adam's monologues appear to contain many briefer utterances than his dialogues, the MLU could, therefore, mainly reflect differences in the style of interaction and not the linguistic level of the children. The tantalizing question as to differential instructional effectiveness can, therefore, not even be answered on a general level.

Although the differences between the dyads need to be kept in mind, the similarities in the interactions and the maternal input and feedback seemed to predominate. Not only did both children progress quite well in their language development, but the maternal techniques seemed also to be specifically tailored for linguistic instruction. Although their effects could not yet be proven, these patterns could be preliminarily employed as

models for intervention experiments. No harm can be expected from the utilization of principles employed routinely by parents and the potential for positive effects could be considerable. If employed in simplified experiments, the instructional utility of some of these patterns might be more easily corroborated.

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Figure Captions

1. The versatility of maternal feedback to specific learning strategies of their children
2. The versatile employment of one specific type of maternal feedback to a variety of filial strategies
3. Maternal versatility in intensive teaching episodes consisting of two immediately successive maternal techniques

Table 1

The Categories Employed to Code Instructional Techniques and Learning Strategies and their Code Numbers

Code Number	Categories[1]
01	Simple imitation
02	Expansion; Reduced imitation in the Child's case
03	Structural imitation
04	Substituting imitation
05	Combinatory imitation
06	Incorporation
07	Chaining
08	Two-person sentence
09	Imitation combined with self-repetition
10	Quotation
20	Self-repetition
21	Completion
22	Build-up sequence
23	Break-down sequence
24	Morpheme perseveration (only bound morphemes)
25	Replacement of major constituents
26	Replacement of minor constituents
27	Frame variation (syntactic change, meaning retained)
28	Optional transformation
29	Vocabulary perseveration (new or rare items)
40	Contrasting correction
41	Challenge
50	Provides a label
51	Mapping
52	Rephrasing

Table 1 continued

Categories and Codes (cont.)

Code Number	Categories[1]
53	Asks for a label
54	Asks for a verb
55	Feature elaboration
56	Action elaboration
57	Functional elaboration
58	Complex elaboration
59	Asks a complex question
60	Requests repetition
61	Item specification
71	Encoding of mental state
80	Positive feedback; not employed for the child
81	Negative feedback; not employed for the child
99	Other
00	Uncodable

1. Generally the same categories and codes were employed for mother and child. Exceptions are specifically noted for the categories in question.

Table 2

Overall differences in input and interactions between the two mother-child dyads expressed in percentages

		Dyad with Adam	Dyad with Eve
Overall N of utterances:			
	Child	62.2	41.8
	Mother	37.8	58.2
N of strategies Child		55.8	39.2
N of techniques Mother		44.2	60.8
Episode structure:			
Child	Same theme	50.7	33.4
	New theme	10	6.7
Mother	Same theme	34.8	55.8
	New theme	2.7	1.9

Figure 1

The versatility of maternal feedback to specific learning strategies of their children

	Adam					Eve				
	Child Code	Mother Code	F_o	%	F_e	Child Code	Mother Code	F_o	%	F_e
(a)	29	29	219	.64	53	29	29	197	.68	63
		24	116	.34	114		80	101	.35	36
		2	75	.22	59		24	87	.30	69
		1	64	.19	42		2	78	.27	47
		28	36	.11	57		0	60	.21	36
		27	28	.08	47		28	44	.15	46
		51	28	.08	17		1	43	.15	23
		7	25	.07	19		27	38	.13	59
							9	32	.11	7
							23	29	.10	26
							25	28	.10	58
							61	27	.09	25
							99	25	.09	34
							51	24	.08	34
							40	22	.08	16
							81	20	.07	9

Figure 1 cont.

(b)

Adam					Eve				
Child Code	Mother Code	F_o	%	F_e	Child Code	Mother Code	F_o	%	F_e
24	24	224	.66	104	24	24	98	.34	30
	1	85	.25	38		29	53	.18	27
	2	77	.23	53		1	39	.14	10
	28	51	.15	52		2	29	.10	20
	29	50	.15	48		0	27	.09	15
	61	40	.12	29		28	25	.09	20
	25	35	.10	42		80	24	.08	15
	0	30	.09	25		61	19	.07	11
	27	29	.09	43		27	18	.06	25
	7	24	.07	17					

Figure 1 cont.

Adam

	Child Code	Mother Code	F_o	%	F_e
(c)	51	24	98	.29	62
		2	92	.27	31
		1	37	.11	23
		29	36	.11	28
		51	29	.09	9
		28	21	.06	31

Eve

Child Code	Mother Code	F_o	%	F_e
51	2	100	.35	34
	80	86	.30	26
	51	65	.23	25
	24	59	.20	50
	29	53	.18	45
	1	37	.13	17
	28	36	.13	33
	61	29	.10	18
	40	24	.08	11
	25	23	.08	41
	7	21	.07	9

	Child Code	Mother Code	F_o	%	F_e
(d)	2	24	57	.17	63
		25	37	.11	26
		29	36	.11	29
		28	36	.11	31
		2	29	.09	32

Child Code	Mother Code	F_o	%	F_e
2	80	84	.29	20
	2	47	.16	26
	29	46	.16	35
	27	34	.12	33
	9	28	.10	4
	23	25	.09	14
	25	24	.08	32
	24	24	.08	39
	0	19	.07	20
	51	18	.06	19

Figure 1 cont.

	Adam					Eve				
	Child Code	Mother Code	F_o	%	F_e	Child Code	Mother Code	F_o	%	F_e
(e)	25	24	153	.45	125	25	2	79	.27	32
		2	105	.31	64		80	57	.20	25
		1	70	.21	46		24	53	.18	48
		29	68	.20	58		28	52	.18	32
		25	58	.17	51		0	49	.17	25
		0	56	.16	30		1	35	.12	16
		28	54	.16	62		29	35	.12	43
		27	54	.16	52		25	32	.11	40
		61	43	.13	35		27	30	.10	41
		7	39	.11	21		61	28	.10	
		4	23	.07	14		40	20	.07	11
		60	23	.07	11		4	19	.07	8
		51	22	.06	19		7	19	.07	9

Figure 2

The versatile employment of one specific type of maternal feedback to a variety of filial strategies

	Adam					Eve				
	Child Code	F_o	%	F_e	Mother Code	Child Code	F_o	%	F_e	Mother Code
						29	101	.35	36	
						51	86	.30	26	
(a)	29	14	.04	7 ——	80	2	84	.29	20	
						25	57	.20	25	
						50	48	.17	11	
						22	41	.14	22	80
						27	26	.09	12	
						23	24	.08	18	
						24	24	.08	15	
						9	22	.08	5	
						20	19	.07	13	

Figure 2 cont.

(b)

Adam					Eve				
Child Code	F_o	%	F_e	Mother Code	Child Code	F_o	%	F_e	Mother Code
22	116	.34	52	2	51	100	.35	34	2
25	105	.31	64		25	79	.27	32	
51	92	.27	31		29	78	.27	47	
24	77	.23	53		22	65	.23	29	
21	77	.23	32		2	47	.16	26	
29	75	.22	59		99	44	.15	28	
23	60	.18	48		50	35	.12	15	
50	59	.17	42		23	33	.11	23	
20	55	.16	46		27	32	.11	16	
99	46	.14	43		20	30	.10	18	
7	28	.08	13		24	29	.10	20	
53	26	.08	13		61	24	.08	8	
28	25	.07	14		4	20	.07	9	
27	25	.07	13						

Figure 2 cont.

Adam

	Child Code	F_o	%	F_e	Mother Code
(c)	50	98	.29	31	1
	24	85	.25	38	
	22	80	.24	37	
	25	70	.21	46	
	29	64	.19	42	
	23	62	.18	34	
	20	48	.14	33	
	99	39	.11	31	
	51	37	.11	23	
	21	34	.10	23	

	Child Code	F_o	%	F_e	
(d)	0	63	.19	40	27
	25	54	.16	52	
	22	34	.10	42	
	20	34	.10	37	
	24	29	.09	43	
	29	28	.08	47	
	50	25	.07	34	
	23	24	.07	38	

Eve

Child Code	F_o	%	F_e	Mother Code
29	43	.15	23	1
24	39	.14	10	
51	37	.13	16	
25	35	.12	16	
99	34	.12	14	
22	32	.11	14	
20	25	.09	9	
50	22	.08	7	

Child Code	F_o	%	F_e	
0	56	.19	48	27
29	38	.13	59	
2	34	.12	33	
25	30	.10	40	
23	25	.09	29	
60	20	.07	7	
99	20	.07	35	
24	18	.06	25	
27	18	.06	20	
28	17	.06	11	

Figure 2 cont.

	Adam					Eve				
	Child Code	F_o	%	F_e	Mother Code	Child Code	F_o	%	F_e	Mother Code
	0	69	.20	48		25	52	.18	32	
	25	54	.16	62		29	44	.15	46	
	22	51	.15	51		51	36	.13	33	
	24	51	.15	52		22	33	.11	29	
(e)	20	44	.13	44	28	28	27	.09	9	28
	29	36	.11	57		24	25	.09	20	
	2	36	.11	31		0	22	.08	38	
	28	27	.08	13		23	20	.07	23	
	50	26	.08	41		27	20	.07	16	
	7	23	.07	13		61	19	.07	7	
						20	18	.06	17	
						2	17	.06	26	

Figure 3

Maternal versatility in intensive teaching episodes consisting of two immediately successive maternal techniques

Adam

	Mother Code	Mother Code	F_o	%	F_e
(a)	29	29	50	.15	36
		24	43	.13	76
		28	40	.12	39
		27	27	.08	32
		25	21	.06	31

Eve

Mother Code	Mother Code	F_o	%	F_e
	29	130	.45	73
	27	79	.27	69
	25	64	.22	67
	24	64	.22	81
	80	48	.17	42
	28	45	.16	54
29	51	32	.11	40
	22	30	.10	26
	23	29	.10	30
	26	22	.08	16
	0	22	.08	42
	99	22	.08	39
	20	21	.07	27

Figure 3 cont.

(b)

Adam

Mother Code	Mother Code	F_o	%	F_e
24	24	151	.44	168
	28	110	.32	84
	27	88	.26	69
	25	72	.21	68
	29	34	.10	78
	61	34	.10	47
	26	23	.07	22
	0	22	.06	40

Eve

Mother Code	Mother Code	F_o	%	F_e
24	24	145	.50	90
	25	81	.28	74
	27	81	.28	76
	28	67	.23	60
	29	61	.21	81
	51	48	.17	44
	23	31	.11	33
	0	27	.09	47
	22	26	.09	28
	99	26	.09	43
	58	20	.07	13
	61	19	.07	32

Figure 3 cont.

Adam

	Mother Code	Mother Code	F_o	%	F_e
(c)	51	24	19	.06	25

Eve

Mother Code	Mother Code	F_o	%	F_e
51	27	60	.21	37
	51	53	.18	22
	25	42	.15	37
	24	37	.13	44
	29	32	.11	40
	80	26	.09	23
	99	24	.08	21
	23	24	.08	16
	28	23	.08	29

	Mother Code	Mother Code	F_o	%	F_e
(d)	2	24	57	.17	86
		27	50	.15	35
		28	40	.12	43
		25	31	.09	35
		61	26	.08	24
		29	22	.06	40

Mother Code	Mother Code	F_o	%	F_e
2	25	69	.24	50
	80	63	.22	31
	27	62	.21	51
	28	49	.17	40
	24	41	.14	61
	51	26	.09	30
	29	25	.09	55
	99	24	.08	29
	0	24	.08	31
	61	21	.07	22
	23	18	.06	22

Figure 3 cont.

Adam

	Mother Code	Mother Code	F_o	%	F_e
(e)	25	24	45	.13	68
		27	41	.12	28
		28	38	.11	34
		25	33	.10	28

	Mother Code	Mother Code	F_o	%	F_e
(f)	27	24	44	.13	69
		28	42	.12	34
		27	34	.10	28
		25	28	.08	28

Eve

Mother Code	Mother Code	F_o	%	F_e
25	25	114	.39	62
	28	68	.24	49
	27	64	.22	63
	24	60	.21	74
	23	49	.17	27
	29	48	.17	67
	22	43	.15	24
	99	31	.11	36
	0	26	.09	39
	26	24	.08	15
	51	24	.08	37

Mother Code	Mother Code	F_o	%	F_e
27	27	102	.35	64
	25	64	.22	30
	24	62	.21	76
	29	46	.16	69
	28	43	.15	51
	23	35	.12	28
	99	31	.11	37
	51	26	.09	37
	0	24	.08	39
	22	24	.08	24

Figure 3 cont..

	Adam					Eve				
	Mother Code	Mother Code	F_o	%	F_e	Mother Code	Mother Code	F_o	%	F_e
(g)	28	28	74	.22	42	28	28	96	.33	40
		24	54	.16	84		25	86	.30	49
		27	51	.15	34		24	70	.24	60
		25	49	.14	34		27	64	.22	51
							29	37	.13	54
						28	51	35	.12	29
							23	30	.10	22
							99	27	.09	29
							26	25	.09	12
							22	22	.08	19
							40	20	.07	13